CIRCUTOR

AUDITOR

CIR-e^3

USER'S MANUAL

(M98225801-03-09A)

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1.- LIMITATION OF LIABILITY

CIRCUTOR, S.A. reserves the right to modify the device or the specifications of the equipment, described in this instruction manual, without prior notice. **CIRCUTOR, S.A.** recommends obtaining the latest version of the unit's specifications.

	CIRCUTOR, S.A recommends the use of the original cables and accessories supplied with the unit.

2.- VERIFICATION UPON RECEPTION

CIR-e³ has been designed to incorporate the latest technologies and it offers the most advanced performance features in the market for the measurement and recording of the electrical parameters of electrical networks.

	Please read this manual carefully before connecting the unit, in order to avoid any incorrect usage that could seriously damage the unit.

Check the following when you receive the unit:

a) The unit's specifications are the same as those on your order.
b) The unit has not been damaged during transport.
c) Check that the following accessories are included:

1	***CIR-e³*** Measurement unit
1	SD Card with a minimum capacity of **1 Gb**.
1	Kit of three E-FLEX clamps, 54 cm.
1	Kit of six power supply and voltage cables (2 m).
4	Crocodile clamps.
1	RS-232 Communications cable.
1	SD Card reader.
1	Instruction Manual

3.- SAFETY PRECAUTIONS.

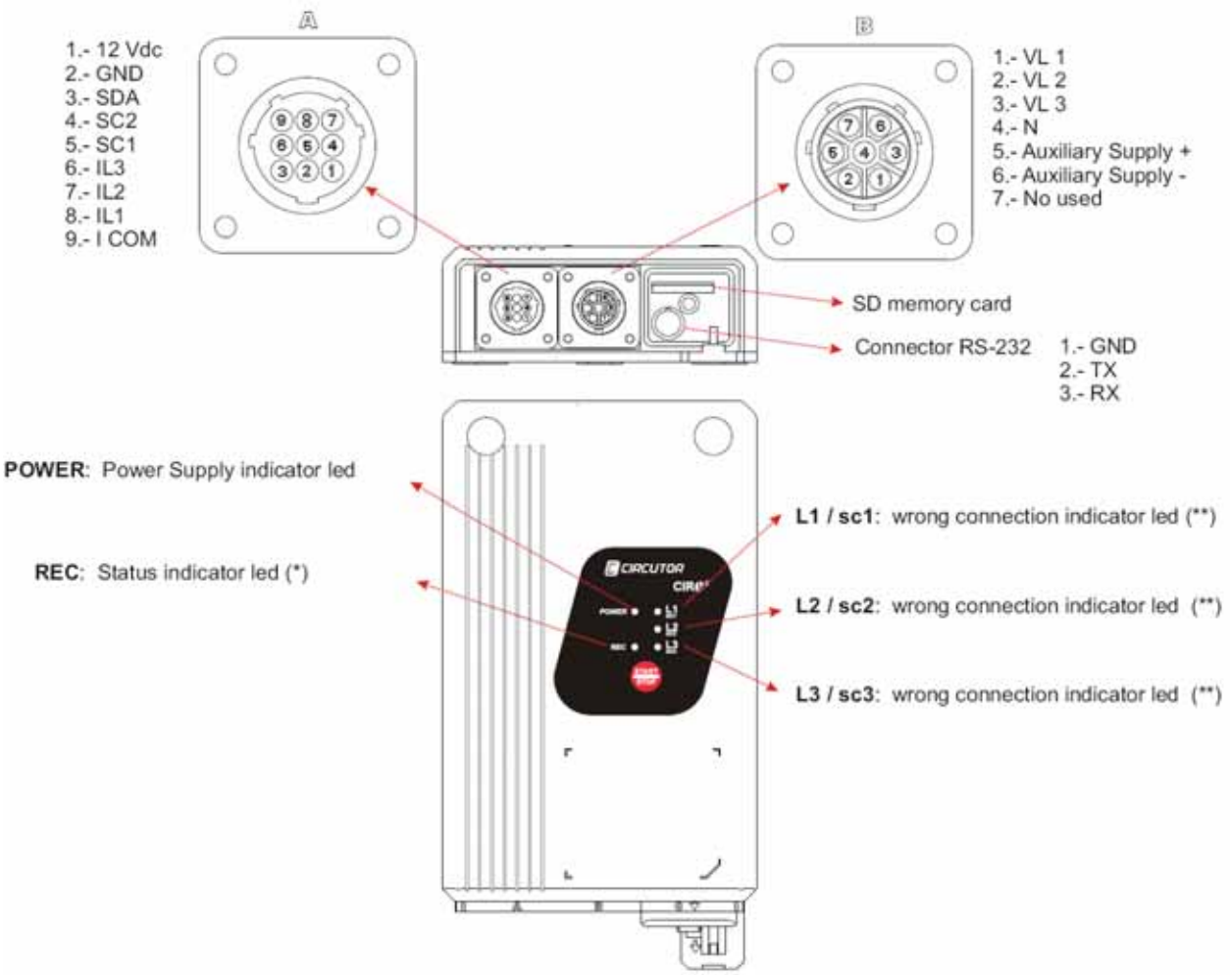
Please observe the warnings described in this manual. The warnings are marked with the following symbols.

DANGER: Electrical risk warning.

ATTENTION: Special attention message or warning.

4.- DESCRIPTION OF THE UNIT

The figure shows the description and location of the analyzer's components.



Connector *A* is used to connect the current sensors. The drawing describes the functionality of each pin.

Connector *B* is used to connect the voltage references of the unit. Connector *B* is used to connect the voltage references of each phase (marked with VL1, VL2 and VL3), the neutral reference (marked with N) and two additional pins (5 and 6) used to power the unit, as shown in the figure. Terminals 5 and 6 are used to power the unit independently from the measurement, in order to guarantee a permanent recording flow when powering the analyzer with an uninterruptible power supply system. More information about the unit's measurement and power supply features in section *4.1 Electrical Features*.

The SD card slot is used to insert the removable SD memory card to record the electrical parameters measured by the unit.

The functionality of the RS-232 connector is reserved to potential updates in the unit's firmware version.

The *POWER* LED is on when the unit is powered. It is off when the unit is not powered.

The *START/STOP* button has different functions, depending on the analyzer's operation. It is used to select the scale desired for the current sensors or to start or stop the recording of electrical parameters. In this case, to start or stop the recording process, hold the button during **2 seconds**.

(*) The *REC* LED has three basic modes. When it is off, the unit is not recording information. When it is permanently on, the unit is recording electrical parameters, which are stored in the SD memory card. When the *REC* LED is flashing, there is an error in the SD memory card. The *REC* LED can be flashing for the following reasons:

- No memory card inserted in the unit's SD card slot.
- The memory card inserted does not have the correct format or data can not be written. (for example, if the card is write protected or it has a FAT32 format; please change the format of the memory card to **FAT16**).

(**) The LEDs corresponding to *L1/sc1*, *L2/sc2* and *L3/sc3* can also indicate different situations, depending on the unit's status and during the start-up procedure.

- Should the ***CIR-e³*** unit detect a connection of flexible clamps during start-up, the LEDs can be used to select the scale desired for the current sensors. In this case, reference will be provided with the legend of the LED shown on the scale (*sc1*, *sc2* or *sc3*).
- When you have selected the scale (if needed) or the unit detects clamps with a single scale automatically (so that the scale selection process is not required), the LEDs will start flashing to indicate that there is an incorrect connection. The phase LEDs can start flashing for various reasons:

    - Incorrect connection of the voltage references. Flashing indicates that there is an incorrect phase sequence (L1, L2 and L3).
    - The unit detects power values with a negative sign (as in the case of generated power).
    - The installation's power factor is under 0.86, i.e., the angle between the voltage and current corresponding to that phase exceeds 30º. This error indicates that there is a fault in the unit and we recommend going through the connections.

	CIR-e³ LED's start flashing to indicate a connection error. The unit has been installed correctly when the LED's are permanently on.

4.1.- ELECTRICAL FEATURES

Power supply circuit (connector *B*, brown and green wires)	
AC voltage	85…400 Vac
DC voltage	60…315 Vdc
Frequency	50…60 Hz
Consumption	9 V·A
Measurement circuit	
Voltage	10…300 Vac (p-neutral)
	17…520 Vac (p-p)
Current (…/2V)	5…100% Clamp E.F.
Frequency	45…65 Hz

4.1.1.- MAXIMUM/MINIMUM CURRENT, DEPENDING ON THE CLAMP AND SCALE SELECTED.

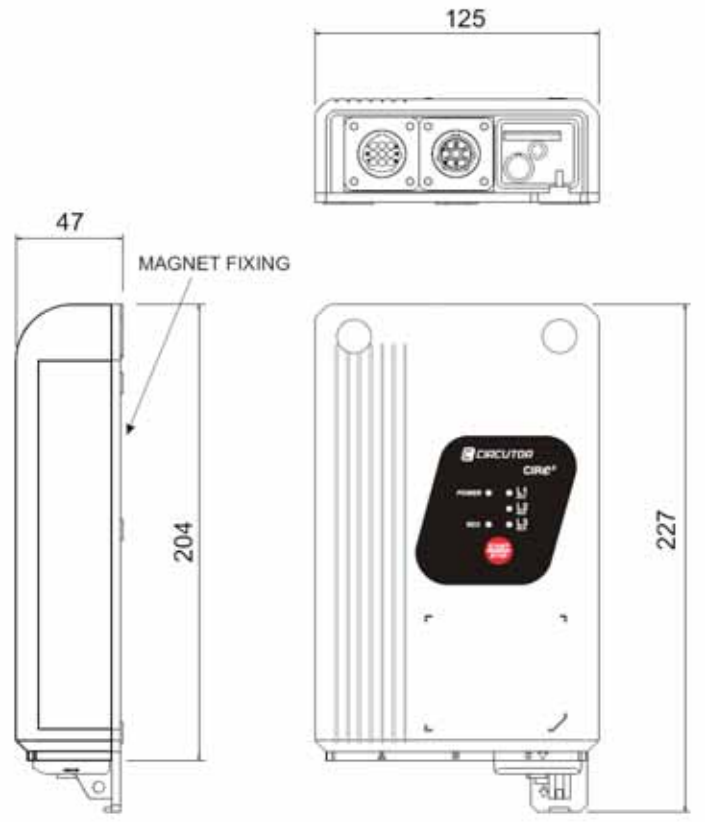
Clamp	LED	Scale	Range (2.5...100%)
E-FLEX 54 cm	L1/sc1	200 A	5…250 A
	L2/sc2	2,000 A	50...2,000 A
	L3/sc3	20,000 A	500...20,000 A
TP-CLIP-5A		5 A	0.1…5 A
TLE-CLIP-200A		200 A	200 A

NOTE: We recommend a nominal measurement current of 50% to 100% of the scale base selected when installing the unit. Therefore, you will guarantee that the current sensors are working in their linear zone.

4.2.- MECHANICAL FEATURES.

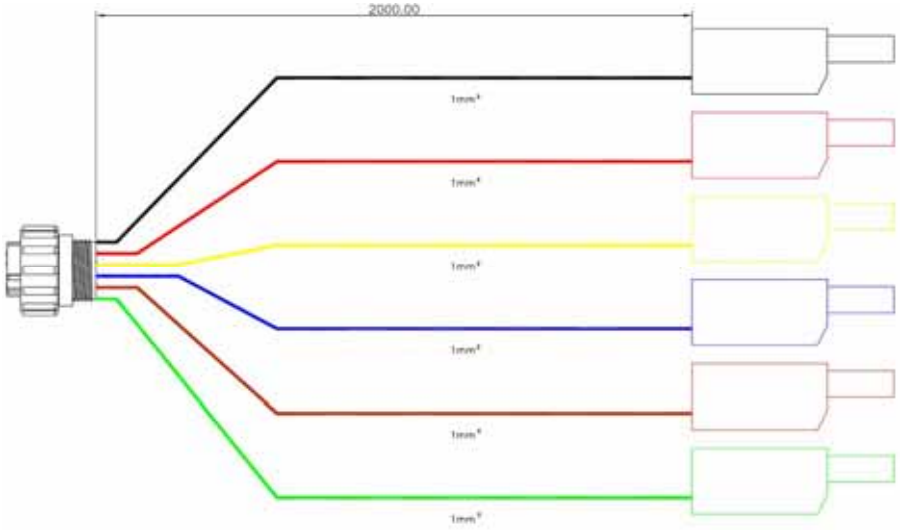
The ***CIR-e³*** analyzer has been specially designed for an installation in small spaces. For example in boxes with double isolation, where billing energy meters, single or three-phase models, are installed.

The external dimensions in mm are as follows:



The overhead connector layout of the voltage clamps has the following configuration.

	Connector pin	Colour of the cable	Phase
	1	BLACK	(L 1) PHASE 1
	2	RED	(L 2) PHASE 2
	3	YELLOW	(L 3) PHASE 3
	4	BLUE	(N) NEUTRAL
	5	BROWN	Auxiliary power supply
	6	GREEN	Auxiliary power supply



4.3.- ELECTRICAL PARAMETERS

The parameters recorded by ***CIR-e³*** can not be selected and they are those shown on the following table. The parameters are valid for three and single-phase circuits.

4.3.1.- THREE-PHASE CIRCUIT PARAMETERS

The following table shows the parameters recorded by the unit during the measurements taken in an unbalanced 4-wire three-phase system.

Parameter	Symbol	L1	L2	L3	III	Max Min
Phase-neutral voltage	$V_{p\text{-}N}$	X	X	X		X
Phase-Phase voltage	$V_{p\text{-}p}$	X	X	X		X
Current	*A*	X	X	X	X	X
Frequency	*Hz*	X				X
Active Power (consumed)	*kW*	X	X	X	X	X
Reactive power L (consumed)	*kvarL*	X	X	X	X	X
Reactive power C (consumed)	*kvarC*	X	X	X	X	X
Apparent Power (consumed)	*kVA*	X	X	X	X	X
Power Factor	*PF*	X	X	X	X	X
Active Energy (consumed)	*kW·h*				X	X
Reactive Energy L (consumed)	*kvar·h L*				X	
Reactive energy C (consumed)	*Kvar·h C*				X	
Maximum Demand (Md)	*kW (Md)*				X	X
Harmonic decomposition V (25º)	*Arm V*	X	X	X		
Harmonic decomposition A (25º)	*Arm V*	X	X	X		
THD V	*THD V*	X	X	X		
THD I	*THD I*	X	X	X		
Fundamental V		X	X	X		
Fundamental I		X	X	X		

The unit will take the same parameter readings even when the system recorded does not have a neutral connection.

4.3.2.- SINGLE-PHASE CIRCUIT PARAMETERS

The electrical parameters recorded by ***CIR-e³*** when the unit is connected to a single-phase circuit correspond to L1; all others are recorded with zero value.

In order to guarantee the unit's safe operation, all persons installing or using the unit must follow the safety measures established in the current low voltage safety regulations, as well as all warnings defined in this instruction manual.

If you use the unit in a way that is not specified by the manufacturer, the protection of the unit may be compromised and the user might be harmed.

5.- BASIC FEATURES

The ***CIR-e³*** analyzer is a programmable measurement unit that **measures, calculates and records** the main electrical parameters of single and three-phase industrial networks in its memory. We must highlight the following concepts:

Serial number: The serial number of ***CIR-e³*** is an important parameter, since all files generated by the unit must be identified with that number. The 10-digit serial number is written on the rear features label of ***CIR-e³.***

Programming: The unit is programmed with the setup software ***CIR-e³.exe.*** The application is stored in the SD card supplied with the unit. In addition, the card records the electrical parameters that are sent to the Web server.

Display (in Cir-e³ Web): The measurement unit includes the right of use of the associated software that is required to handle the energy data of the ***CIR-e³ Web*** application. It is located in a web site that is active 24 hours a day, 365 days a year: http://cir-e3.circutor.com.

Installation: The analyzer can be installed to analyze balanced (3 wire) or unbalanced (4 wire) single and three-phase networks. The unit must be powered with the auxiliary power supply cables in any of the connection options. The auxiliary power supply cables of the unit are Brown and Green and they correspond to terminals 5 and 6 of connector B, respectively.

Measurements: The analyzer takes 128 samples per cycle of the voltage and current variables in true root mean square (TRMS). With all of the samples taken, the unit calculates the arithmetic mean during the recording period selected by the user. The analyzer also records the maximum and minimum values measured during each period. To take these measurements, the analyzer has four voltage sensor inputs and three current sensor inputs.

Recording: The unit has a 1 Gb external SD memory, FAT16 format, which stores the parameters measured or calculated by the analyzer. We must highlight the following features:

- It stores the parameters instantly (measured for a selected period).
- It stores the maximum and minimum values of the recording period selected.
- The SD memory can be expanded to 2 Gb.
- The approximate size of files is as follows, depending on the recording period:

Recording period	Recording time	Size
1 minute	1 day	**1,027 kb**
10 minutes	1 day	**103 kb**
15 minutes	1 day	**69 kb**
120 minutes	1 day	**9.2 kb**

Current sensors: The analyzer can work with different models of current sensors. One type of sensor has a single measurement scale. Another sensor model is flexible, allowing the configuration of various measurement ranges. The flexible clamps supplied with the ***CIR-e³*** analyzer are of the E-FLEX 54 model and can be used with three different scales. More information about the clamps in chapter *9. Features of the E-FLEX 54 clamps*.

5.1.- ENVIRONMENTAL AND OTHER FEATURES

Environmental Work Conditions	
Temperature	10…50 ºC
Altitude	≤ 2.000 m
Humidity	95% RH non-condensing
Others	
Storage temperature	-10…65 ºC
Degree of protection	IP 53
Weight (only CIRe³)	0,677 kg
Weight (with packaging)	0,733 kg

This manual contains information and warnings that must be observed at all times to guarantee the safe operation of the unit and maintain it in perfect working conditions.

	If you use the unit in a way that is not specified by the manufacturer, the protection of the unit may be compromised and the user might be harmed. Removing covers or eliminating protection elements may provide access to dangerous parts.

When you suspect an operational fault in the unit's protection system (for example, visible damage), disconnect the unit from any voltage or current source and contact a qualified service representative or the after sales service of **CIRCUTOR, S.A.**

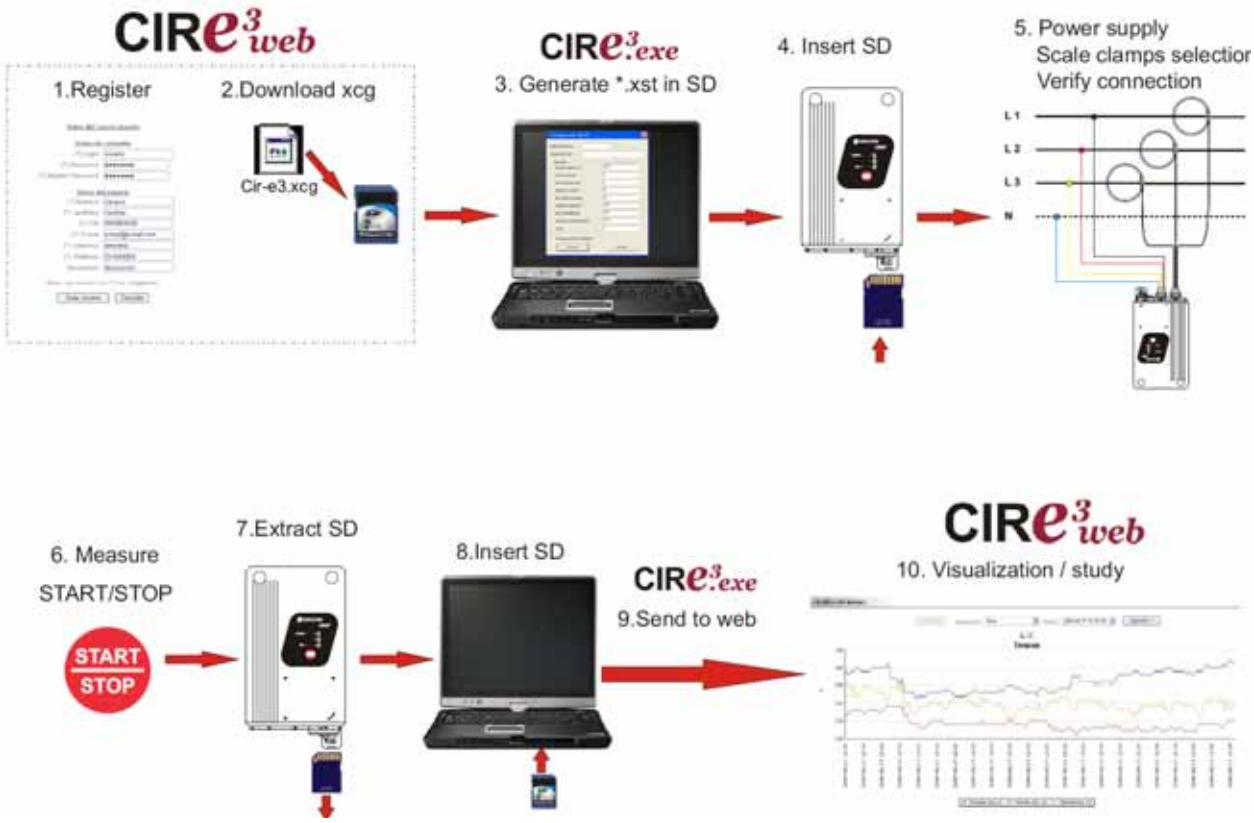
	Anyone installing or using the equipment must follow the safety measures set forth and all warnings indicated in this instruction manual to guarantee a safe operation.

6.- INSTALLATION AND COMMISSIONING

CIR-e³ is a portable analyzer that is easy to install and use. It has been designed to facilitate the work of the companies and/or persons that wish to perform energy audits (study of consumption) and control the main electrical parameters in an installation.
The study of these parameters is the first step to analyze the response of loads and the consumption habits of a company or corporation. Without a doubt, the decisions taken after the study can be focused on a more rational consumption of energy and a decrease in the power demand of the electricity network.

The unit is configured from the PC with the SD card supplied with the unit. After selecting the scale desired for the current sensors (in the case of flexible clamps), make sure that all voltage and current connections are correct so that the unit is ready to take measurements and record data.

*Operation of **CIR-e³** in **10** easy steps*



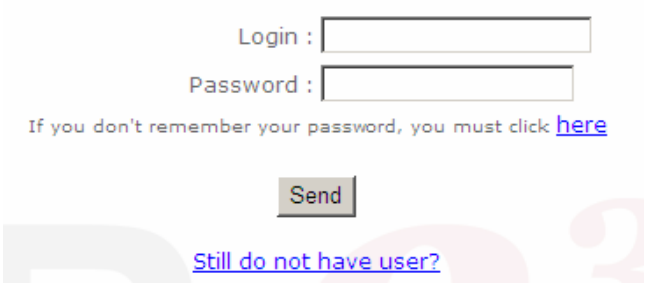
Please follow these steps to configure, install and commission the unit.

6.1.- CONNECTING TO AND REGISTERING IN CIR-E³WEB

The web page is a tool used to analyze and export the files recorded by the ***CIR-e³*** analyzer. Web site: http://cir-e3.circutor.com. The access and registration procedure is described next.

6.1.1.- ACCESSING CIR-E3 WEB

Open http://cir-e3.circutor.com in your browser to access the data handling page of ***CIR-e³Web***. The following start screen will be displayed when you open the page in your browser.



You must register when accessing the page for the first time in order to access the Web-based application.
To register, click on ***Still do not have user?***. The registration process is explained in section *6.1.2. Registration*.

The fields *Login* and *Password* are used by users that have already been registered in the system:

Login:	User name
Password:	Access password

After entering the *login* and *password*, click on "*Send*" to access the Web site.

6.1.2.- REGISTRATION

You must fill in the registration form when accessing ***CIR-e³Web*** for the first time. Its function is to reserve a space on the web site that you can use to send and handle the data recorded by the ***CIR-e³*** device.

To register, click on ***Still do not have user?***. Click on this link and the application will display the registration form. Fill it in with your information.

The following information is requested to register a new user:

Login:	Access name used to register and access future connections to the ***CIR-e³Web*** server. You can enter alphanumerical values in this field, although we recommend not using symbols, accents, etc.
Password:	Access password with which the user is registered and which will be used in future connections to the ***CIR-e³Web*** server. You can enter alphanumerical values in this field, although we recommend not using symbols, accents, etc.

CIF: Company / Personal Tax Identification code.
E-mail: Contact email address.
Company: Name of the company.
Telephone: Contact phone.
Description: Description of the account (optional).

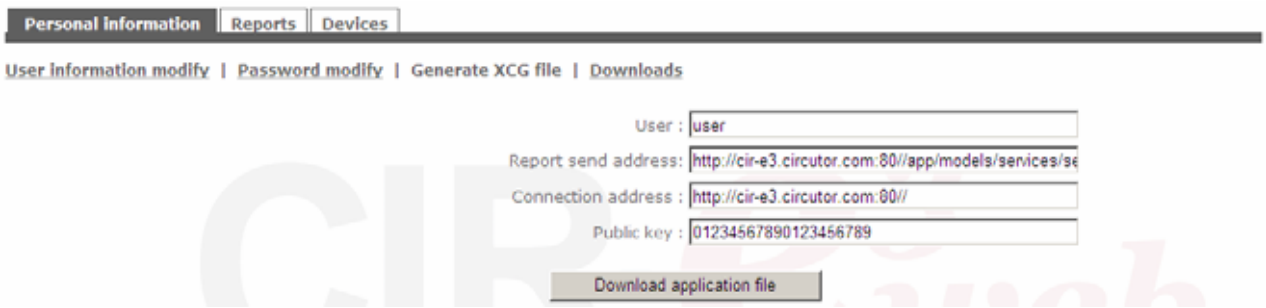
After filling in the form, click on "*Create user*" to validate the data and register the user.

This is when the user is created with the registration form and already has access to the ***CIR-e³Web*** page. You will be able to send an unlimited number of files and access the page an unlimited number of times to check and handle the information sent to the server.

Select "*Cancel*" to stop the user registration process and the application will return to the previous screen.

6.2.- DOWNLOADING THE XCG IDENTIFICATION FILE:

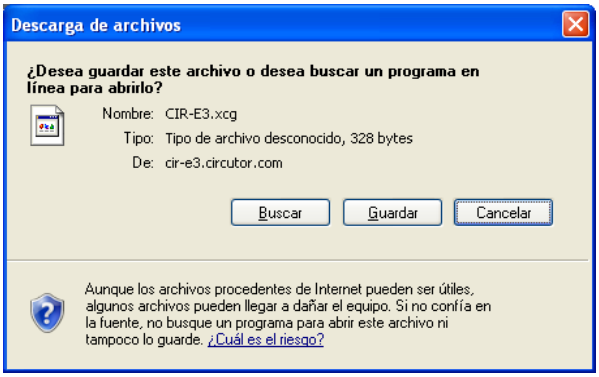
After the registration is complete, the data will be submitted semi-automatically and the SD card must have a file that is used by the system to know the address, as well as the Web space (user area) where the information is located.
Therefore, once you fill in the form and are registered in the system, download from the Web the file that will identify you during subsequent logins and which will be used to send data to the server. The file downloaded that identifies the user's ID and sending address must be stored in the SD card. The file has the *xcg* extension.
Therefore, the files generated with ***CIR-e³*** and sent by the user will be automatically sent to http://cir-e3.circutor.com and they will be located in the corresponding space, in order to allow the receiving user to access the data sent, as displayed on the Web page.
To generate and download the *xcg* file, access the Web page and fill in the *"login"* and *"password"* fields and open the menu in the *"Personal information"* tab called "*Generate XCG file*".



The information will displayed on the screen is generated automatically, absorbing the data entered by the user during his registration. You must **NOT** modify the data shown on the screen to prevent future errors when transferring files or preventing user identification errors in the ***CIR-e³Web*** application.

User:	User name
Address:	Web space address destined to the user
Connection address:	Connection address of the data server
Public key:	Data encryption key

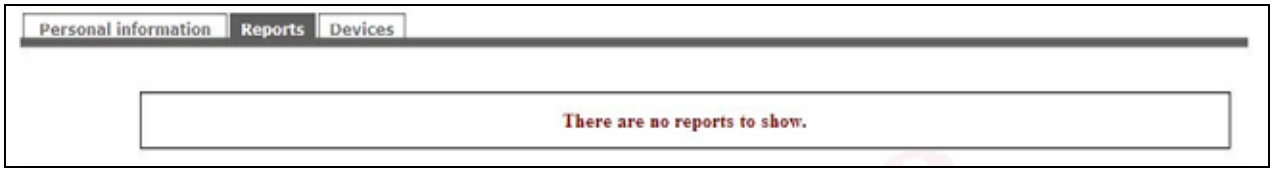
After generating the data, press "*Download application file*",
Press "*Download application file*" and the application will display the following screen, where you can select the file storage destination.


Descarga de archivos
¿Desea guardar este archivo o desea buscar un programa en línea para abrirlo?
Nombre: CIR-E3.xcg
Tipo: Tipo de archivo desconocido, 328 bytes
De: cir-e3.circutor.com
Buscar
Guardar
Cancelar
Aunque los archivos procedentes de Internet pueden ser útiles, algunos archivos pueden llegar a dañar el equipo. Si no confía en la fuente, no busque un programa para abrir este archivo ni tampoco lo guarde. ¿Cuál es el riesgo?

The storage destination must be the root directory of the SD card. This is the same location of the ***CIR-e³exe*** setup application.

6.2.1.- PERSONAL USER INFORMATION ON THE WEB

After enter the Web page, the application will show the following main screen.



The main screen shows a list of the user reports, in particular, those sent to the Web page. When you access the page for the first time, the screen does not show a list of the reports and indicates that there are no reports on the list with the following text "There are no reports to show".

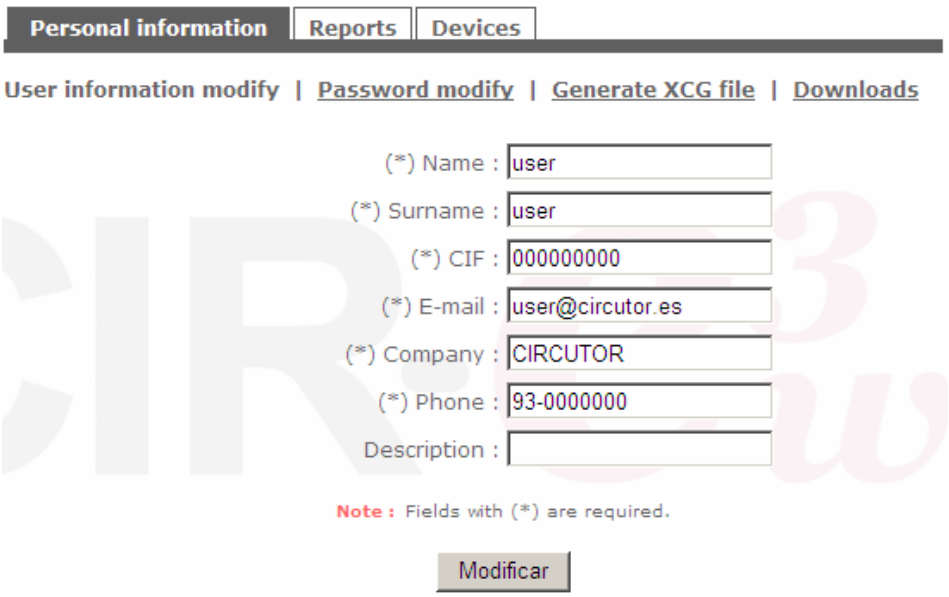
As you can see, the screen has a top menu with three options "***Personal Information***", "***Reports***" and "***Devices***", which are described next.

This point provides a detailed description of the "***Personal information***" menu. The "*Reports*" and "*Devices*" menus are explained in detail in sections *6.10.1* and *6.10.2*, since they correspond to subsequent data analysis stages.

This menu contains all information related to the user data. There are four sub-menus in the "*Personal information*" menu.

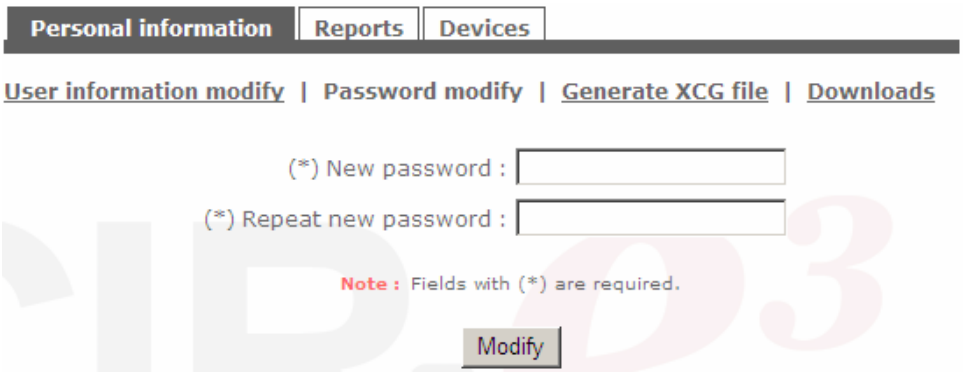
6.2.1.1.- User information modify

The personal information menu option opens the following setup screen. The "*User information modify*" screen is used to modify the data configured by the user in the registration form.



6.2.1.2.- Password modify

The second sub-menu in the "*Personal information*" menu is used to modify the Web page's access password defined by the user in the registration form.


Personal information
Reports
Devices
User information modify | Password modify | Generate XCG file | Downloads
(*) New password :
(*) Repeat new password :
Note : Fields with (*) are required.
Modify

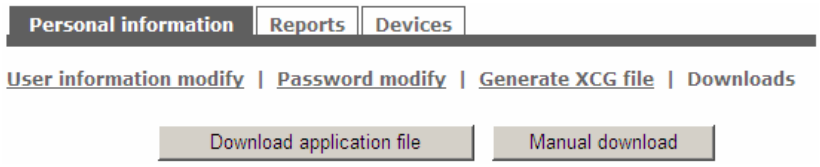
To modify the password used to access the Web page, enter a new password in the "*New Password*" field and confirm it in the "*Repeat new password*" field. Press the "*Modify*" button after entering the new password. The new password will be saved.

6.2.1.3.- Generate XCG file

As explained in section *6.2 Downloading the XCG identification file*, this sub-menu generates the file that identifies the user and his information and the sending address to the ***CIR-e³Web*** application. Click on "*Download application file*" to download the file.

6.2.1.4.- Downloads

The download sub-menu can be used to download the ***CIR-e³.exe*** application file, which is vital to configure ***CIR-e³*** and which allows the download of the unit's manual. The unit configuration application and the complete manual are included in the SD card supplied with the unit. In any case, they are available in this section of the Web page as backup if the user deletes any of the files by mistake.
The screen displays the two download options, which are shown with different buttons.



To download the ***CIR-e³exe*** application that configures the analyzer, click on "*Download application file*".
To download the complete manual of ***CIR-e³***, click on "*Manual download*".

6.3.- CONFIGURING CIRE³

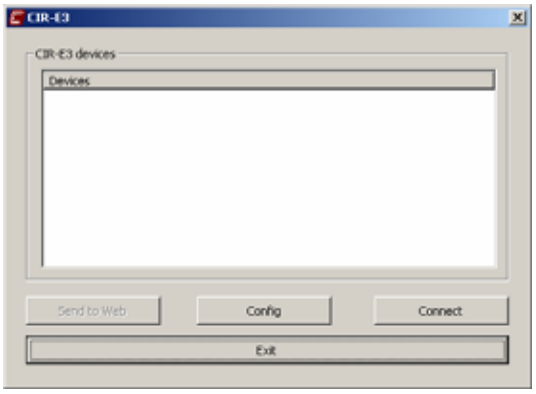
The ***CIR-e³*** analyzer does not have configuration buttons or a setup screen and it needs a file with the configuration information required to register the data. This file has the *xst* extension and it is generated with the ***CIR-e3.exe*** application. This application is supplied with the unit and is stored in the SD card.

6.3.1.- GENERATING THE SETUP FILE

To generate the setup file, run the ***CIR-e³.exe*** application located in the root directory of the SD card.

Cir-e3.exe

The application determines the installation parameters that will determine how the ***CIR-e³*** takes the measurements and records the parameters. These parameters are stored in the SD memory card. The setup application generates a file that must be stored in the SD card and which is named after the unit's serial number and has the *xst* extension. If the setup application is not available, you can also download it from http://cir-e3.circutor.com, in menu "*User information*".
When you run the application for the first time, the window will appear blank, as shown on the figure.

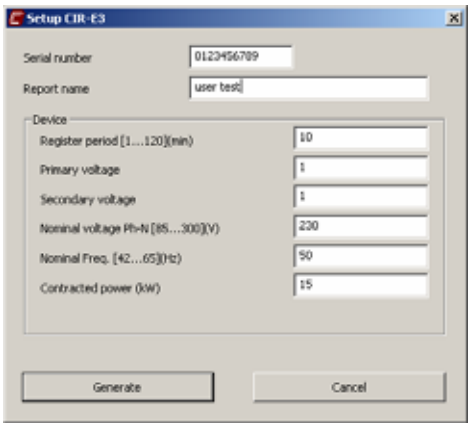

CIR-E3
CIR-E3 devices
Devices
Send to Web
Config
Connect
Exit

6.3.2.- MENU OPTIONS.

The application has 4 different function buttons. "*Configure*", "*Connect*" "*Exit*" and "*Send to Web*".

6.3.2.1.- Configure

Select the configure option to create a **new file with the installation's features for a *CIR-e³***. The following window will be displayed when you click on "*Configure*".



Serial number: Enter the 10 digits of the serial number of the ***CIR-e³*** unit used to take the measurements. The serial number identifies each individual unit. It is written on a label on the back of the analyzer: "*serial no.*" starting with 0102XXXXXX.
The serial number is used by the application as the data name (identifier). The setup file generated by the application will have the *xxxxxxxx.xst* format, where "*xxxxxxxx*" corresponds to the last eight numbers of the unit's serial number.

Name of the report: You can enter the name of the file for identification purposes. This field is limited to 16 characters. For example, you can enter the name of the place where the measurements are going to be taken.

Registration period: The registration period is a value that ranges from 1 to 120 minutes (2 hours) and it corresponds to a time interval during which we use to store the average of the records taken. The analyzer takes 128 samples per cycle of the signals measured. The registration period indicates the interval desired to take the weighted mean of all samples taken and it stores this value in the memory. For example, if you select a registration period of 1 minute, the analyzer calculates the mean of all samples of the variables registered during that minute and stores the results in the memory. From that period, the analyzer also stores the maximum and minimum values measured.

Voltage primary: When using transformers to measure the voltage, enter the primary voltage value of the said transformer. The information related to this feature of the transformer can be found on a features label on the transformer itself. This label must indicate the primary ratio.

In case you are not using voltage transformers and you are taking a direct measurement (up to 300 V p-n), the value entered must be 1.

Voltage secondary: When using transformers to measure the voltage, enter the secondary voltage value of the said transformer. The information related to this feature of the transformer can be found on a features label on the transformer itself. This label must indicate the secondary ratio.
In case you are not using voltage transformers and you are taking a direct measurement, the value entered must be 1.

Nominal voltage (V): Enter the nominal voltage value between the installation's phase and neutral.

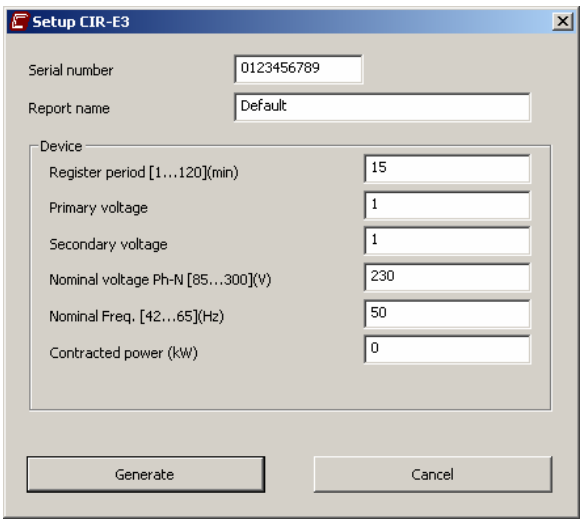
Nominal Freq.: Enter the nominal value of the installation's frequency. The range allowed for this field ranges from 42 to 65 Hz.

Contracted power (kW): You can enter the installation's contracted power (this is only for information purposes and it does not have an impact on the unit's configuration).

After completing the configuration of ***CIR-e³***, click on "*Generate*".
When you select "*Generate*", the software automatically creates file xxxxxxxx.xst in the root directory of the SD card (stored in the default directory). The name file is the same as the serial number of the unit entered in the setup menu, including the unit's configuration and installation's characteristics, as shown on the following figure. The unit will take this configuration when starting the measurements and the data will be recorded from the SD memory card.

12345678.xst

If you do not generate a setup file, store it in the root directory of the memory card or when the ***CIRe³*** analyzer can not find the location of the memory card before the parameter recording process starts, it will automatically load a setup file that has a series of default parameters defined. The default file loaded by the analyzer is called "***Default***" and its features are described on the following figure.



Serial number: The serial number of the setup file is the unit's serial number.
Name of the report: The name of the report is "*Default*".
Recording period: Established as 15 minutes
Voltage primary: The transformer's primary value is 1 (direct measurement)
Voltage secondary: The transformer's secondary value is 1 (direct measurement)
Nominal voltage (V): The standard nominal voltage is 230 Vac
Nominal Freq.: The standard frequency is 50 Hz.
Contracted power (kW): The default file does not include the contracted power

6.3.2.2.- Connect

Another option of the ***CIR-e³.exe*** application is "*Connect*". This option automatically connects with the main page of the ***CIR-e³Web*** application, as shown on the following picture.

The purpose of this option is to allow the user to immediately access this Web application to display the data sent from the application, ensuring that the user must run other programs to access the Web.

6.3.2.3.- Exit

The "*Exit*" option closes the application and cancels the unit's setup file creation process.

6.3.2.4.- Send to Web

The "*Send to Web*" button will be explained in detail in section *6.9 Send to Web*. This part of the manual talks about how the data recorded by the ***CIR-e³*** analyzer are sent to the ***CIR-e³ Web*** data operation application.

6.4.- INSERT SD CARD

Insert the analyzer's SD memory card after creating the analyzer's setup file with the ***CIR-e³.exe*** application and recording the file generated (with an *xst* extension) in the root directory of the SD memory card.

The SD card should be inserted in the card slot before starting the unit, since the analyzer will be configured automatically with the default file described in section 6.3.2.1. if it does not find the setup file in the SD memory card. The card must be upside down.

	Wait 5 seconds before starting the recording and insert the SD memory card in the unit. After completing the recording and stopping the data recording process with the *START/STOP* button, you must also **wait 5 seconds** before removing the memory card.

VERY IMPORTANT:

	The unit only detects cards with the FAT 16 format. If you use an SD memory card with a FAT 32 format, the unit will not be able to write on the card and it will display the corresponding write error, so that the *REC* LED will start flashing. Please do not use cards that have information you wish to store and perform backup copies of the information stored frequently.

6.5.- START-UP SEQUENCE

The analyzer does not have a screen with the parameters being measured, so that you can not check whether the connection is correct. Therefore, we recommend following the process described in the following warning box. Observe the steps recommended to interpret the messages indicated by the analyzer in the event of an anomaly.

	We recommend following this installation procedure: **1. Insert SD card.** **2. Insert connector *A*, current clamps.** **3. Insert connector *B*, voltage references.** **4. Power the analyzer.** **5. Select the scale of the current clamps (in flexible clamps).** **6. Check the voltage phase inversion.** **7. Install the current clamps.** **8. Check the installation of the current clamps.** **9. Start the recording process.**

After inserting the SD card in the analyzer's slot, connect it to start measuring and taking the readings of the installation's electrical parameters. The connection process is explained in detail in the following points.

6.5.1.- POWER AND CONNECT THE UNIT

Insert connectors *"A"* and *"B"*, corresponding to the references of the current and voltage sensors of the ***CIR-e³*** analyzer, respectively, before powering the unit. The analyzer is powered with the brown and green auxiliary power supply cables (pins 5 and 6, respectively). When you connect the auxiliary power supply cables, the unit will be lit and it will show that it is on with the *POWER* LED.

After powering the unit, connect the phase voltages. If you need to power the measurement's analyzer, you can connect the reference voltages to power it.
Before powering the unit, it is important to connect (no necessarily install) the current sensors, since the analyzer will identify the current sensors connected after it is powered, in order to store their scale in the memory.

	If you power the unit without connector *A* of the current clamps, the unit will be configured with the 5 A clamp scale. To configure a different scale, turn the unit off so that it can reset the scale selection process.

If you power the unit and it identifies the current sensors connected and, therefore, those desired to take the readings from a single scale, the analyzer will detect them and it will be self-configured for the said scale (stored in its memory).

This scale will be used to perform the calculations required to obtain all other electrical parameters stored in the memory. Should the analyzer automatically identify the clamps connected as clamps with a single scale, ***CIR-e³*** will move onto the connection error verification process to detect any connection errors in the voltage phases, as explained in section *6.5.3 Verification of the connections,* of this manual (i.e., the user will not go through the scale selection process).

However, if you power the analyzer and it identifies the current sensors in connector *A* as sensors operating in more than one scale, the analyzer then moves onto the next step, which is the selection of the scale desired for the recording process (from the scales that can be used by the sensors connected). The three LEDs *L1/sc1*, *L2/sc2* and *L3/sc3* will start flashing, so that you can select the range desired to take the measurements.

The procedure followed to select the scale desired manually when using current sensors for various scales is explained in detail in section *6.5.2. Selecting the scale* of this manual.

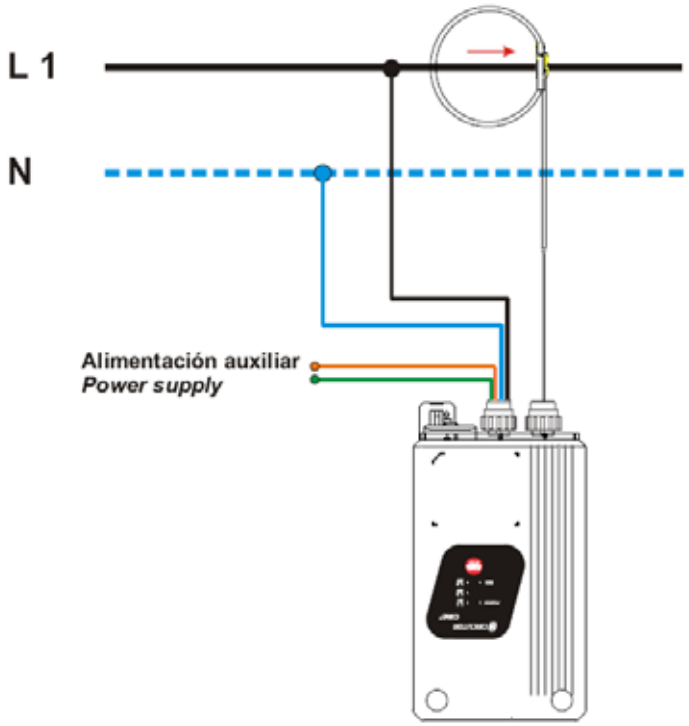
To power and connect the analyzer correctly, respect the phase sequence, as shown on the table.

Connector pin	Colour of the cable	Reference phase
1	BLACK	(L 1) PHASE 1
2	RED	(L 2) PHASE 2
3	YELLOW	(L 3) PHASE 3
4	BLUE	(N) NEUTRAL
5	BROWN	Auxiliary power supply
6	GREEN	Auxiliary power supply

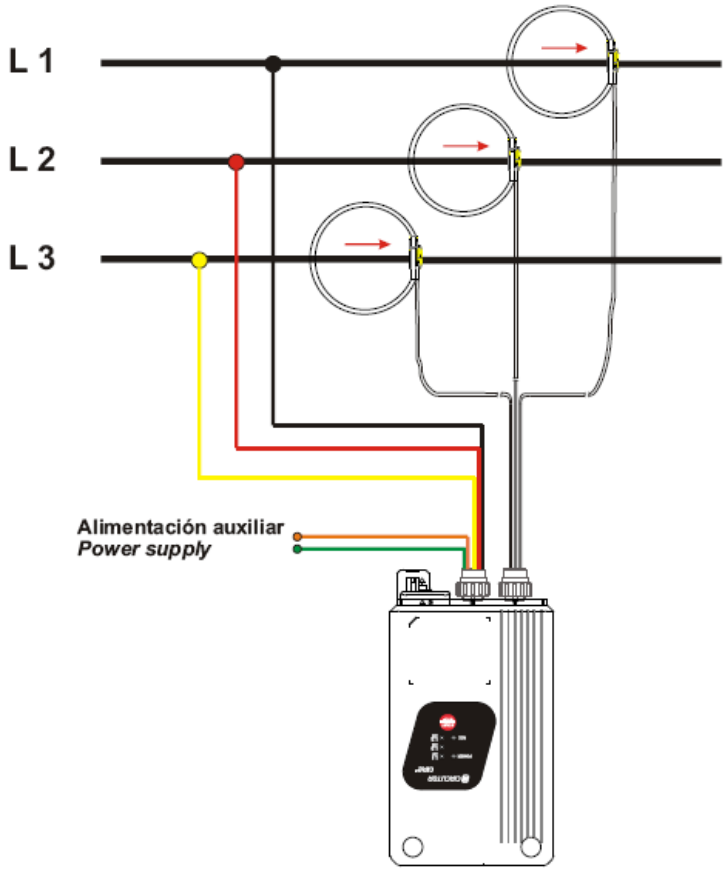
The connection diagrams show the unit's connection options. The connection diagrams show the connection options of the analyzer in single and three-phase installations with three or four wires (with neutral).

The analyzer's connection diagrams show the final voltage and current sensor connections, even though we recommend waiting until you reach the point in section *6.5.3 Verification of connections* before installing the current sensors, in order to simplify the interpretation of error messages displayed in the LEDs while you are installing ***CIR-e³***.

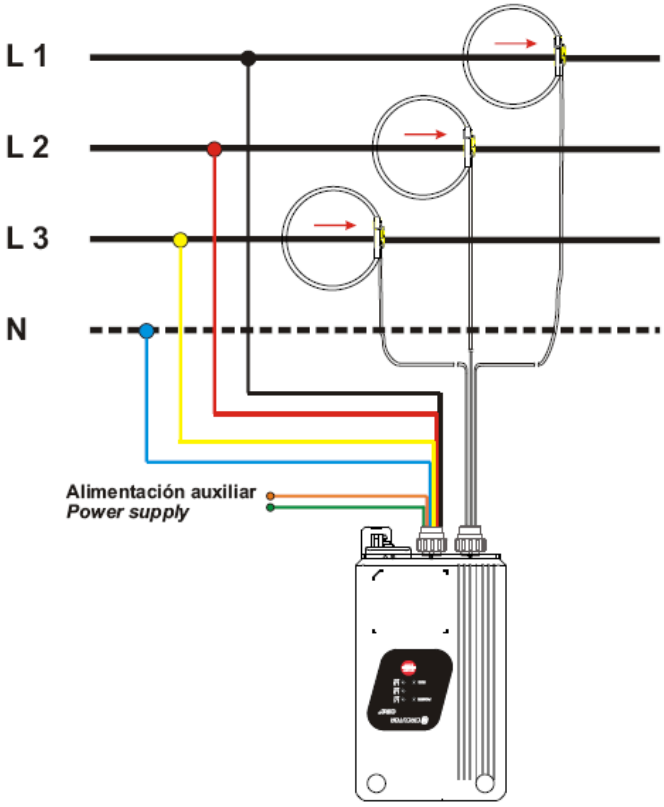
6.5.1.1.- Single-phase connection diagram



6.5.1.2.- Three-phase connection diagram (3 wires)



6.5.1.3.- Three-phase connection diagram (4 wires)



After powering the analyzer, configure the scale to record data after the flexible clamps have been connected. The unit's scale selection process is explained in the next section of this manual.

6.5.2.- SELECTING THE SCALE FOR FLEXIBLE CLAMPS

After inserting the voltage connectors and powering the unit, the *POWER* LED will turn on and search and detect the current sensors connected. When you have connected flexible current sensors, i.e., with more than one configurable scale to measure the current value, you can select the most adequate scale to take the readings, depending on the nominal current of each line you wish to measure, such as the current value, among other parameters.
For example, if the line where you wish to take the measurements has a nominal current of 150 amps, the most adequate scale to measure that nominal current value will be *L1/sc1* lower scale, which, in the case of the *E-FLEX 54* flexible clamps, corresponds to the 200 amp scale base. However, if the line where the measurements are going to be taken has a nominal current of, for example, 3,000 amps, you must select a higher scale, *L3/sc3*, which corresponds to the 20,000 amp scale base.

Prior to the detailed explanation of the scale selection procedure, a table is attached with the features of the flexible current sensor, model *E-FLEX*, 54 cm long, included with the unit.

Clamp	Scale	Value	Measurement range
E-FLEX 54 cm	L1/sc1	200 A	5…250 A
	L2/sc2	2,000 A	50...2,000 A
	L3/sc3	20,000 A	500...20,000 A

The scale selection procedure for the flexible clamp models is described next.

When you start the analyzer and it has detected that flexible clamps are connected, the three LEDs on the front panel of the unit will start flashing: *L1/sc1, L2/sc2 and L3/sc3.*
The LEDs show that the unit is in standby mode until you manually select the desired scale. LEDs will flash **during 30 seconds** when the unit is waiting for the selection of the scale.
To select the scale manually, press *START/STOP*. When you press the button, the *L1/sc1* LED will start flashing, showing that you have selected the *L1/sc1* scale (in the case of E-FLEX clamps, it will correspond to the 200 amp scale). If you press *START/STOP* again, LED *L2/sc2* will start flashing (in the case of E-FLEX clamps, it will correspond to the 200 amp scale).

Finally, if you press *START/STOP* again, LED *L3/sc3* will start flashing (in the case of E-FLEX clamps, it will correspond to the 20.000 amp scale). This is how you can start a rotating work loop: sc1 – sc2 – sc3 – sc1 – sc2 – etc., until you select the scale desired.

Let the LED flash after the unit has lit the scale desired to take the measurement.
When one of the three scales (*sc1*, *sc2* or *sc3*) is flashing during **7 seconds and the user does not press a key**, the unit will detect the scale selected by the user and store the configuration in its memory to start recording the information with the scale selected.

If you do not select the scale manually, i.e., while the unit is in the scale selection process, the *START/STOP* button is not pressed and the LEDs are flashing during **30 seconds**, the unit will configure the default scale automatically to start recording parameters. The **default scale** used to configure the unit when it has not been selected manually is **L2/sc2** (it corresponds to the **2,000 Amp** scale in the case of the E-FLEX 54 clamp).

After configuring the scale desired, the unit starts to verify the correct connection of the unit, as explained in detail in point *6.5.3 Verification of connections*, always in the *STOP* mode, until you press the *START/STOP* button to start the recording, regardless of whether the unit has been self-configured (after the 30 seconds) or you have selected the scale manually (with the *START/STOP* button.

This is when the *START/STOP* button recovers its original function, i.e., the start and stop of the recording. When you press *START/STOP* during more than **2 seconds**, the unit starts or stops the recording, always on the same file. The unit will never create duplicate files or files with different names for each record.
If the unit is switched off in the *START* mode (recording), it will restart in the normal scale selection mode (when clamps used for various scales are connected). If you do not press the scale selection button during **30 seconds**, the unit will recover the last clamp scale configuration (if this scale is possible with the clamps detected) and it will automatically start recording, with no need to press the *START* button again, i.e, there has been an involuntary power supply interruption and the auxiliary power supply has been re-established. If the unit detects clamps with a single scale after the power supply is reconnected, it will detect them and self-configure itself with the scale related to the clamps connected, returning to the recording status automatically.

	If you select a different scale to the one that was configured before after the power supply interruption and system restart, the unit deletes the file with recorded data and generates a new one, including the new configuration selected.

If the unit is disconnected from the power supply in the *STOP* mode, the unit is restarted in the scale selection mode. The selection process will be restarted if the unit has flexible clamps connected. If you do not change the scale after **30 seconds**, the unit will retrieve the last configuration stored. When other clamp models are connected, the unit does not select the scale, since it will detect the clamp's scale automatically. In both cases, the process is started in the *STOP* mode.

6.5.3.- VERIFICATION OF CONNECTIONS

The analyzer will start the connection verification process after you select the scale or the unit detects the single-scale clamps automatically. This process is carried out by the unit continuously, regardless of whether it is recording data or not.
We must highlight that the analyzer will indicate faulty connections with the same LEDs used during the scale selection process *sc1*, *sc2* and *sc3*, using a different form of indication. In this case, the LEDs will stop flashing and lit LEDs indicate a correct connection while unlit LEDs indicate an incorrect connection.
The causes of faulty connections during a phase are explained next:

6.5.3.1.- Faulty connection

The analyzer can indicate a faulty connection for various reasons.

- Phase sequence error.
- Current clamp is not connected correctly or is inverted.
- Power with a negative sign.
- Power factor (P.F.) is lower than 0.86 (angle > 30º).

⚠	A faulty connection can be due to a problem in the connection of the voltages or currents, so that we recommend following this procedure: **1. Install voltages and check all connections** **2. Install the current clamps and check all connections** Follow this procedure to check whether the flashing LEDs are due to an error in the voltage sequence or an incorrect connection of the current clamps.

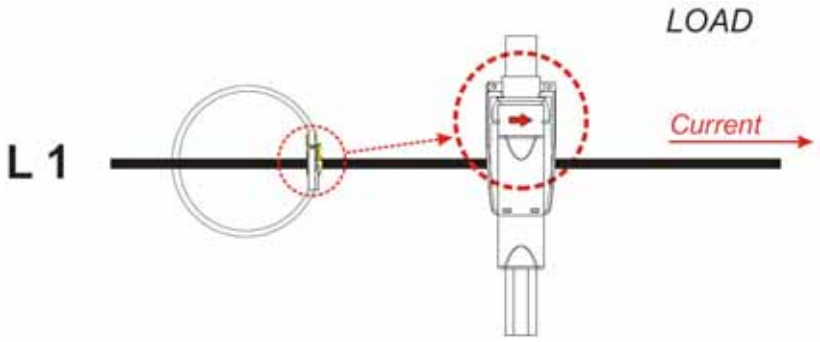
We recommend checking the connections of all voltages after installing the current clamps with the bus bars or installation's cabling measured and after selecting the scale. The unit will turn off the *sc1, sc2 or sc3* LEDs to indicate an incorrect installation sequence of the voltage phases.
The figure shows an example of how the ***CIR-e³*** unit indicates the faulty connection of voltages in phases L2 and L3. In this case, exchange the voltage connections, i.e., L2 and L3.

LEDs *L1/sc1, L2/sc2 and L3/sc3* must be lit before installing the flexible current clips to the bus bars or measurement wire, as shown on the figure.

After connecting the voltage references of the ***CIR-e³***, install the flexible current sensors supplied with the unit.

You must respect the installation position of the current sensors to guarantee the correct recording of the electrical parameters. To interpret the messages indicated by the *CIRe³* unit on the *L1/sc1*, *L2/sc2* and *L3/sc3* LEDs in relation to a faulty connection of the current sensors connected to the unit, we recommend installing the clamps one by one, in order to detect individual errors.

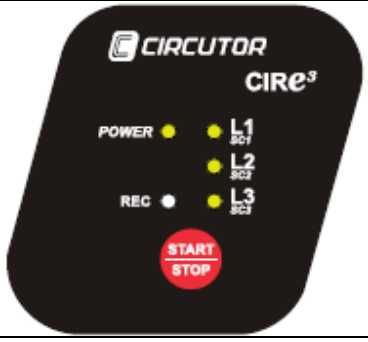
The correct position of the current sensors is shown on the clamp with an arrow that indicates the direction of current in the installation, from the main connection to the load point, as shown on the following figure.



When the unit detects a faulty clamp connection, i.e., a negative power, an angle of more than 30º, the **Lx/csx** LED corresponding to the fault connection phase will start **flashing**. In this case, check the connection of the current clips to make sure that the installation follows the colour code and that the direction of the current clamps is as shown on the previous figure.

L1/sc1 *flashes*, indicating a faulty clamp connection. In this case, check the clamp to make sure that it is tightly closed and connected to observe the installation's current direction, as shown on the arrow, and that the clamp connected and identified with *L1*, *L2* and *L3* is installed in the corresponding phase, in accordance with the corresponding voltage colours, which are *BLACK*, *RED* and *YELLOW*, respectively.

Before starting the parameter recording process, the unit must have all phase LEDs lit and the current clamps must be installed, with no flashing LEDs. This means that the unit is powered and that all voltages and current clamps connected are taking the readings correctly.
The figure shows the LED status when it has been connected to a three-phase system before starting the parameter recording process with the *START/STOP* button.



6.6.- START/STOP BUTTON

After following these steps and making sure that the unit is connected, hold the red *START/STOP* button **during 2 seconds** to start recording the installation's parameters. When you hold the *START/STOP* button, the *REC* LED will be lit, indicating that the electrical parameters are being recorded as shown in the figure.

When you wish to stop the recording process, hold *START/STOP* **during 2 seconds** to stop and end the recordings.

⚠	When the memory card is full during a recording, the unit will automatically change to the *STOP* mode and indicate the incident with the *REC* LED, which will start *flashing*.

To send the data stored in the SD memory card to the ***CIR-e³Web*** application, extract the SD memory card from the analyzer safely. To extract the memory card safely, follow the procedure described in section *6.7 Safe extraction of the SD memory card*.

6.7.- SAFE EXTRACTION OF THE SD MEMORY CARD

To extract the SD card safely, make sure that the unit is not in the recording mode. The *REC* LED must be off. If the *REC* LED is on or flashing, stop the recording by pressing *START/STOP* before removing the SD card.

⚠	**Removing the SD card while the unit is in the recording mode can corrupt the file stored in the memory and render it illegible.**

6.8.- INSERT SD MEMORY CARD IN A PC

After inserting the SD memory card in the PC or SD card reader, run the ***CIRe3.exe*** application in the root directory of the memory card.

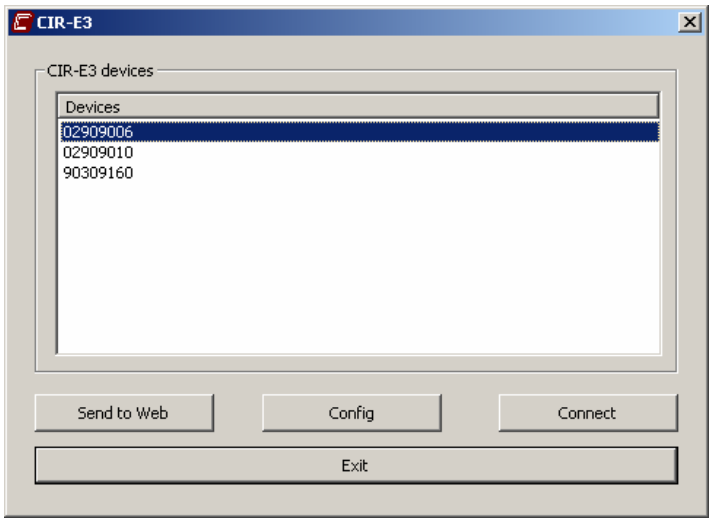
Cir-e3.exe

With the ***CIR-e³exe*** application, you can send information recorded in the SD memory card with the ***CIR-e³*** portable analyzer to the ***CIR-e³Web*** application, which can be used to display the parameters and handle the information sent.

The procedure followed to send data is explained in section *6.9 Transferring data to CIR-e³Web.*

6.9.- TRANSFERRING DATA TO CIRE³WEB

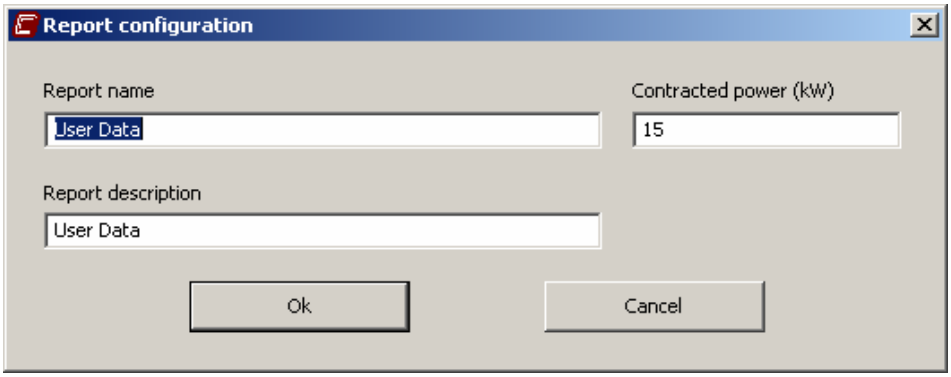
You must have an Internet connection to send data to the application.
After inserting the SD memory card in the computer and running the ***CIR-e³exe*** application, as explained in the previous point, the following window will be displayed.



This window displays the list of files that have been configured with ***CIR-e³exe*** with the *xst* extension and which are in the root directory of the SD memory card.

To send the files recorded, select the file you wish to send to the Web application from the list displayed by the application and select the "*Send to Web*" option. This option is disabled when the window is opened, but it is enabled when you select a file.

If you select a file and click on *"Send to Web"*, the application will display the following screen to configure the report before it is sent to the application.

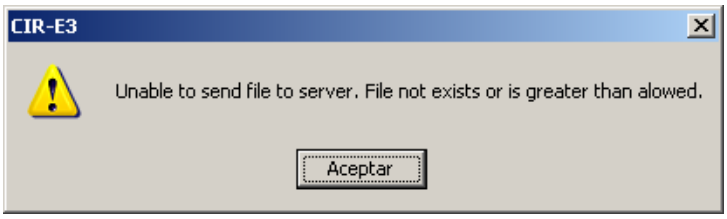


Data requested in this section:

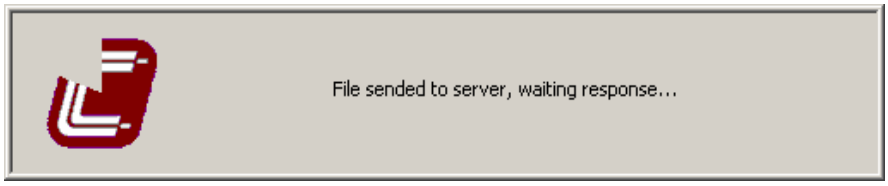
Report name: The report configured before the data are recorded by the ***CIRe3.exe*** application will be displayed by default in the space used to enter the name of the report. You can change this name. This field is limited to 16 characters.

Report description: Likewise, this space shows the name entered for the report. You can enter a description of the data report in this field if the name is not descriptive enough. This field does not have a character limitation.

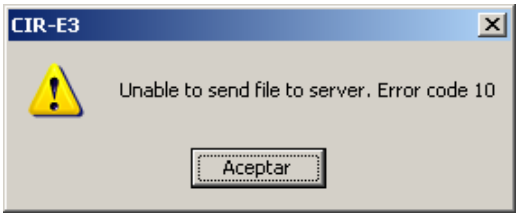
To send the information to the Web application, confirm the data and click on "*Accept*" to send the data.
When there is an error transferring data because of the size of the file or when the data file that must be encrypted and sent is not found (with an *std* extension in the root directory of the memory card), the application will display the following alarm window.



Click on "*Accept*"; if no errors are detected, the application will encrypt the data and send them to the Web page. During this process, the application will display the following window.



If there is an error in the data operation page, the application will display an error message with a numerical code of the fault indicating the reason for the error, displaying the following message: "**The file can not be sent to the server. Error code….**" The numerical error codes are shown on the following table:



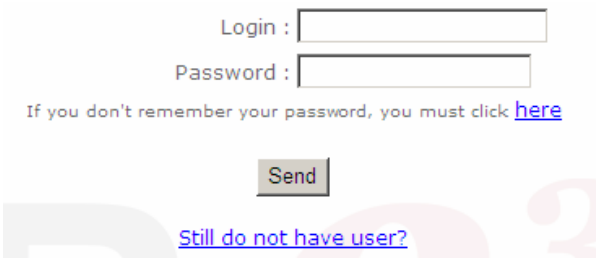
Code	Causes	Solution
0	The file could not be opened or it does not exist	Make sure that the *.std file is in the root directory of the SD card
1 to 16	Incorrect transfer or Web server function	Check the Internet connection

If the file sent to the Web application produces no errors, the application automatically generates a folder in the root directory of the SD memory card, with the same name as the unit's serial number entered in the ***CIRe3.exe*** application and it will store the files with *std* and *xdt* extensions in the folder. The files are stored automatically in the folder created by the application and renamed as follows: YEAR MONTH DAY HOUR,
For example, a file sent on the 10th of March, 2009 at 13:00h will be stored in the folder with a name that includes the serial number as follows: 09031013, as the backup copy of the data sent to the Web application.
When the information has been sent, the program will show a confirmation window.

If you select "*Cancel*" in the confirmation window of the data recorded in the Web page the window will be closed and the data transfer process will be cancelled.
After the data recorded in the Web page is sent, you must connect to the web-based application to handle the information that has been recorded. To do so, click on the application's "*Connect*" option or follow the procedure described in the next point, *6.10 Analysis and display of data*.

6.10.- ANALYSIS AND DISPLAY OF DATA

You must connect to the Web page in the following address to handle the information transferred to the Web page:
http://cir-e3.circutor.com . Enter the page in the browser and the following application access screen will be displayed.



To access your account and view the reports sent, fill in the access data fields with your user registration information. To enter, click on "*Send*"

Login: Access name established during the registration process.
Password: Access password established during the registration process.

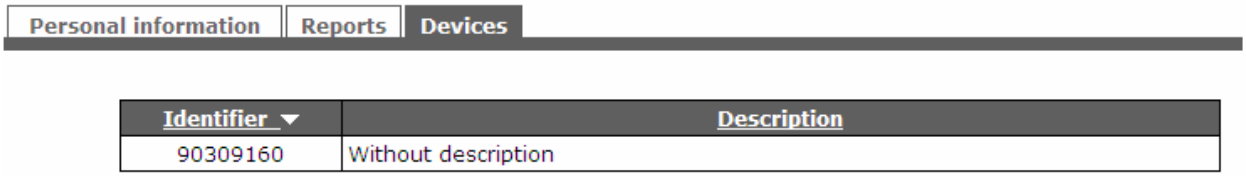
6.10.1.- LIST OF REPORTS

The main screen of the Web application shows the reports. It shows a list of the reports that the user has sent to the Web page. The information displayed in each column includes the file creation date, date when the information was transferred to the Web page, title of the report established by the application and serial number (which must be the same as that of the measurement unit).

The information displayed on this screen can be ordered in ascending or descending order in each column by clicking on the arrow under the title displayed on the top of the table: (date of the report, date of reception, report title or serial number). Select a report to display the parameters recorded in a graph.
After selecting the report, the data will be displayed as explained in section *6.10.3 Parameter selection menu*

6.10.2.- LIST OF DEVICES

The Web application has another menu on the top. "Devices" is another option. The device window shows a list of the units that have recorded information and which have been registered by the user. This information is available when you have used more than one analyzer to take the measurements that have been sent to the Web application.



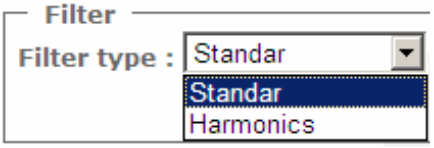
The information included in the "*Devices*" menu option is explained next:

Identifier: Serial number of the unit that has sent a file to the Web application.
Description: This field is reserved for future applications.

6.10.3.- PARAMETER SELECTION MENU

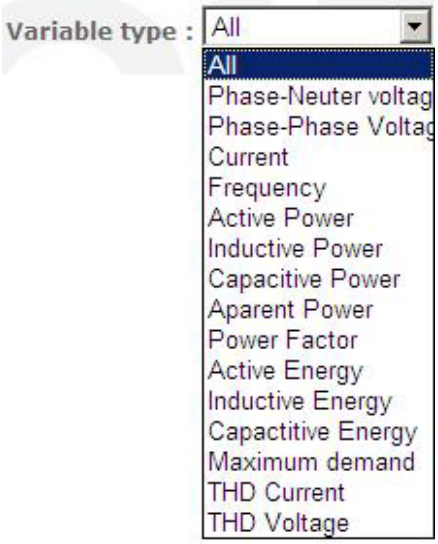
When you select one of the files from the list of reports (described in section *6.10.1 List of reports*), the Web application starts running and it displays a screen with various options. The top menu on the screen is displayed in the following figure.

The application shows all information of the file sent by default. Therefore, the application has a series of information filters. These filters are used to display only specific variables at each moment. The display options depend on the type of filtering option selected.
Filter type: Menu used to filter the information displayed. There are two options, as shown on the figure. Standard and harmonics.



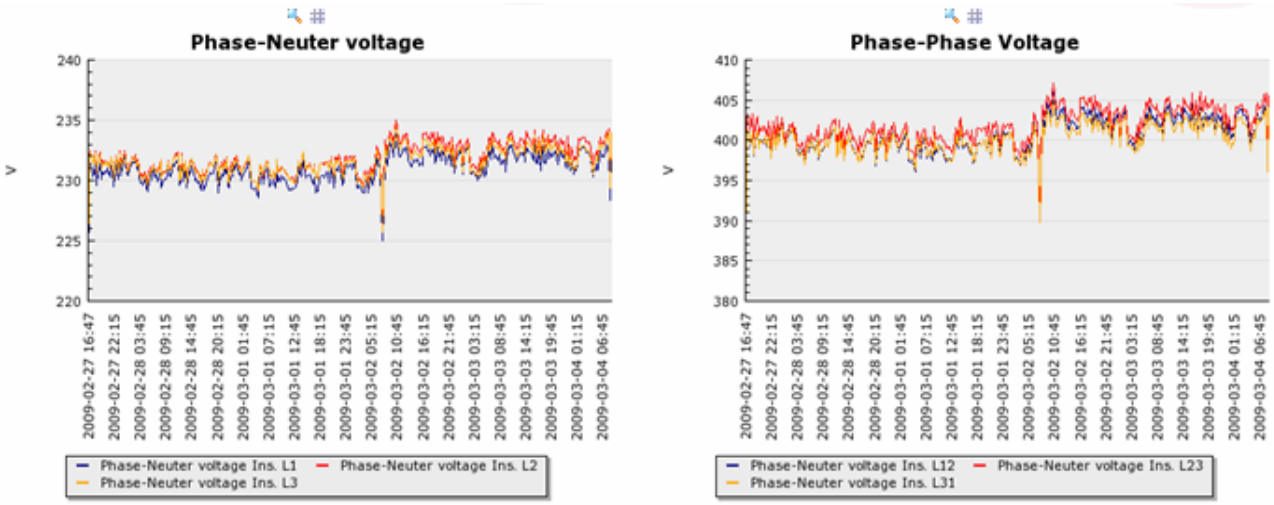
6.10.3.1.- Standard:

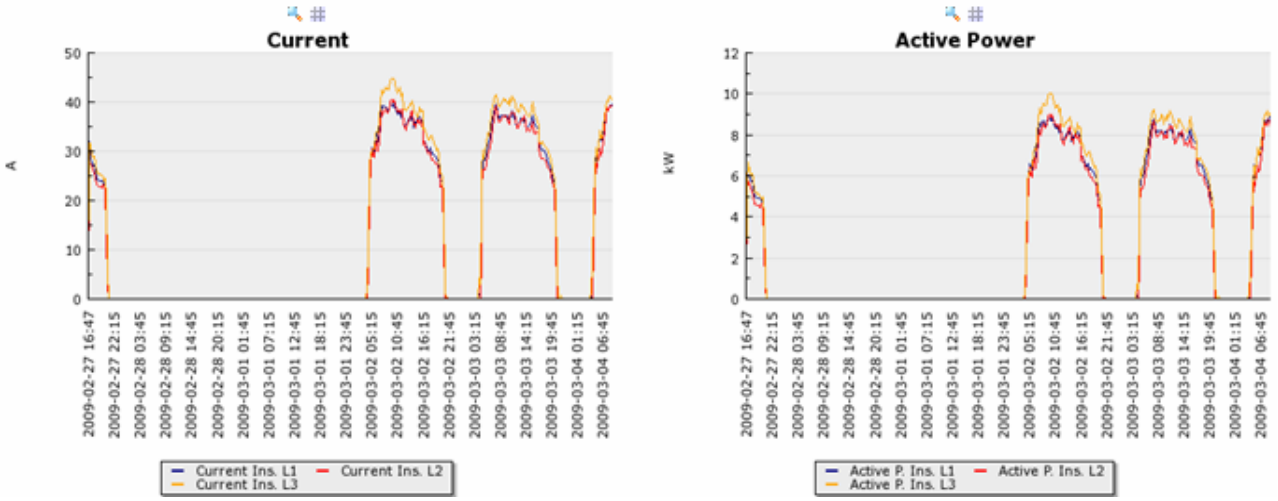
The standard filtering process can be used to individually select each variable recorded. To do so, use the drop-down menu displayed on the following figure. If you only select one variable, it will be displayed as if you select the "*Zoom*" tool, explained in point *6.10.5 Zoom*.



The selection menu with the standard filter option is complete. You can select the instantaneous values, maximum and/or minimum values and three-phase values independently for each phase, as shown on the figure.

The parameters are displayed on a graph when you select the standard filter mode:



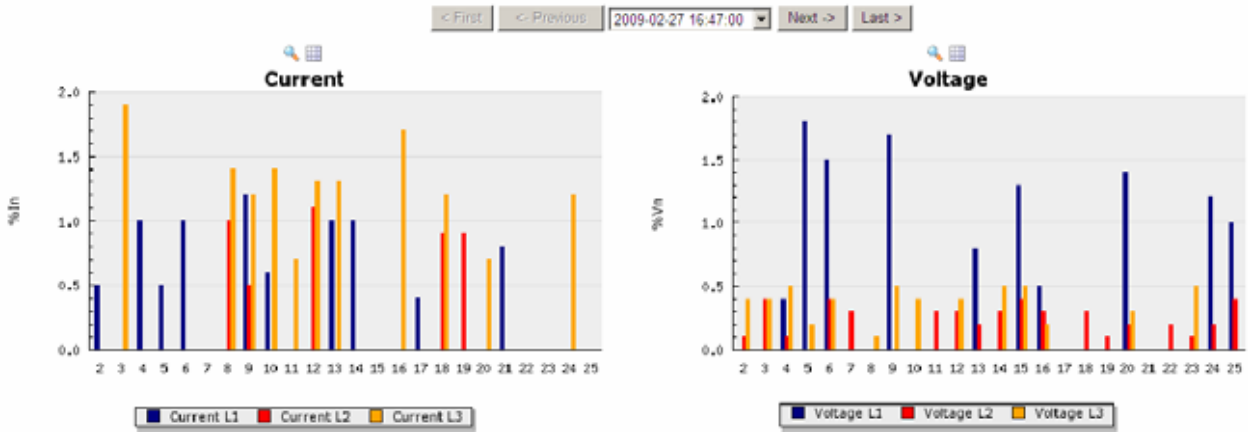


6.10.3.2.- Harmonics:

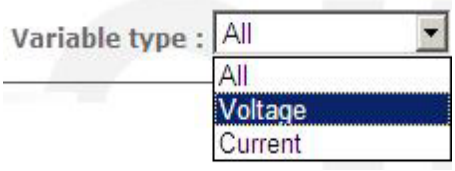
The information is displayed in a bar-chart when you select the harmonic filter mode.

The default presentation screen is the voltage and current harmonics screen.

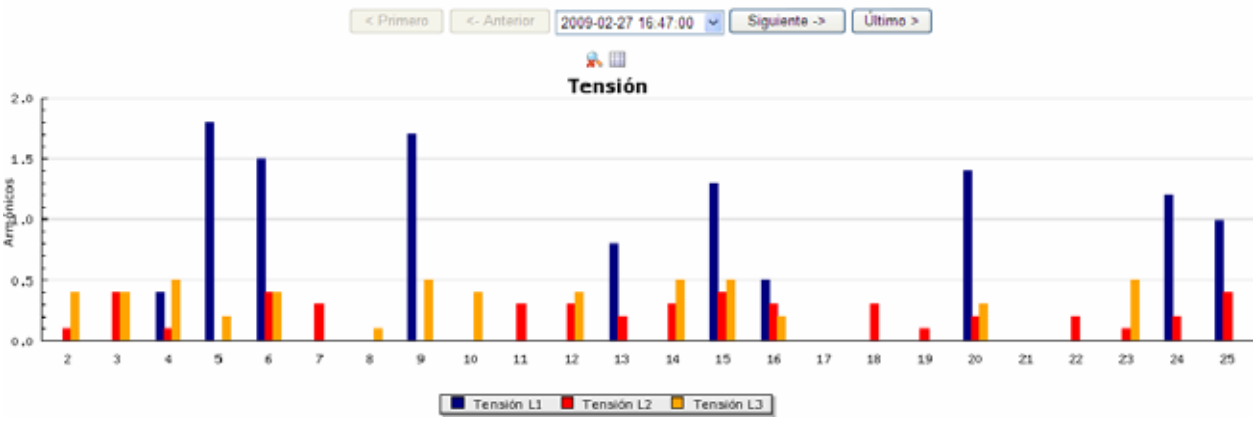
.



The harmonics menu can be used to individually select the variables using the filtering menu on the top part of the screen. The figure shows that the *Current*, *Voltage* or *All* Harmonics can be displayed independently.



You can display each graph with more or less detail, depending on the selection. The graph is displayed on the screen as follows:



This harmonics graph can use the Zoom and Table functions to display the parameters recorded in a table as the representation of the values recorded during a standard filtering operation (see section *6.10.5 Report graphs*)

6.10.4.- REPORT INFORMATION

This part of the visualization screen of parameters recorded and sent to the Web application displays all information related to the configuration of the measurement installation and the parameters configured by the unit used to take measurements.

Report information :
Report : User Data
Description : User Data
Report date : 2009-03-04 08:45:00
Release Date : 2009-05-05 11:17:32
Contracted power(kW) : 15
Active rate : 0
Register period(sec) : 900
Nominal Voltage(V) : 230
Voltage conversion ratio : 1/1
Current conversion ratio : 2000/5

The data displayed is as follows:

Report and *Description*: Displays the name of the report and its description, as used to configure and send files to the Web application.

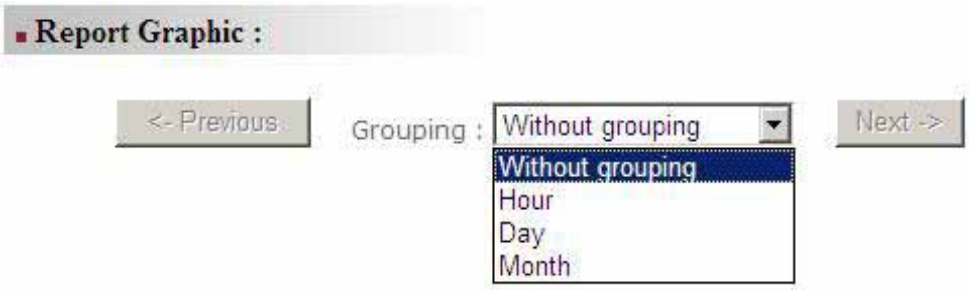
Date of the report: Date when the parameters were created or recorded by ***CIR-e³***

Date of reception: Date when the user transferred the data to the Web page.

All other information displayed in the report setup menu corresponds to the parameters configured with the ***CIR-e³exe*** application, which also corresponds to the features of the installation where the parameters were recorded. The information is related to the nominal voltage and frequency, contracted power, voltage transformer ratio and the configured scale ratio for the current sensors taking the measurements.

6.10.5.- REPORT GRAPHS

The report graphs are also grouped in a menu.

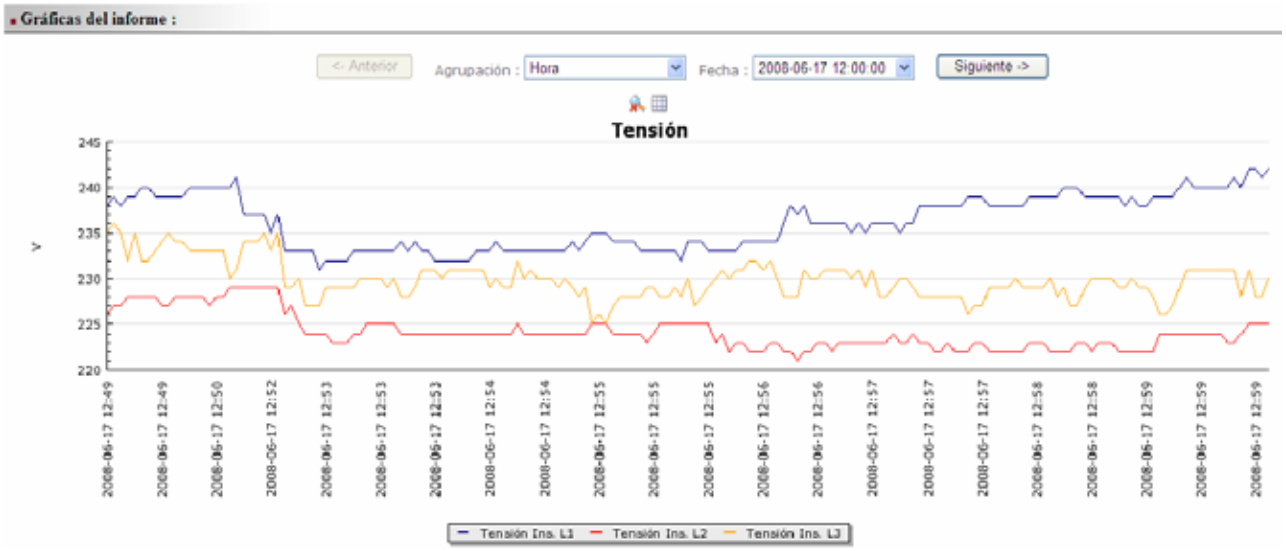


Select "***Not grouped***" to disable the Previous / Next buttons. In any case, the whole values of the records will be displayed on the graphs.

Select "***Hour***", "***Day***" or "***Month***" to disable the *Previous/Next* scroll buttons and jump to the previous "***Hour***", "***Day***" or "***Month***" found in the file sent to the Web. Therefore, the application will group all information recorded by the analyzer and sent to the Web in days, hours or months. This is how you can analyze shorter periods with an independent approach. Use the Previous / Next buttons to scroll through the parameters recorded until you reach the desired interval.

This part of the screen shows the values of the variables recorded in the file on a graph. It displays the values selected in the selection menu described in section *6.10.3. Selecting parameters.*
The top part of the graphs displayed on the parameter display screens show the *Zoom* and *Show table* icons, which are explained next.

Zoom:
The *Zoom* tool zooms in or out selected graphs and shows the whole screen. This tool is useful when you wish to copy the graph and add it to a different document.



To export the images displayed in the Web-based application to a different document or format, right-click "*save image as*" and save the images in a folder. These can be retrieved later on when you wish to add them to a different document.

Show table:

The "*Show table"* tool opens a window that shows all values registered by the analyzer on a table.
The Show table tool does not have a menu to group values, as shown in the graph display option. The values on the table have been stored in this file.

Fecha	VI1	VI2	VI3
2008-06-17 12:49:20	238	226	235
2008-06-17 12:49:20	239	227	236
2008-06-17 12:49:25	238	227	235
2008-06-17 12:49:30	239	228	232
2008-06-17 12:49:30	239	228	235
2008-06-17 12:49:35	240	228	232
2008-06-17 12:49:35	240	228	232
2008-06-17 12:49:40	239	228	233
2008-06-17 12:49:45	239	227	234
2008-06-17 12:49:45	239	227	235
2008-06-17 12:49:50	239	228	234
2008-06-17 12:49:50	239	228	234
2008-06-17 12:49:55	240	228	233
2008-06-17 12:50:00	240	228	233
2008-06-17 12:50:00	240	228	233
2008-06-17 12:50:05	240	227	233
2008-06-17 12:50:05	240	228	233
2008-06-17 12:50:10	240	228	233
2008-06-17 12:50:15	240	229	230
2008-06-17 12:50:15	241	229	231

To export the tables in the Web application to a different document or format, select part or the whole table and right click "*Copy*" to save the table temporarily in the Windows clipboard. Open the document where you wish to paste the table and right click "*Paste*", to add the table on any part of the document.

Print:

The option “print” implements a restructuring of the information displayed in the screen that allows that the user can print all the information in a single document. This option includes the header of the report and the selected graphic.

7.- FAQS

❖ *Can I start recording when the phase LEDs start flashing?*

When LEDs start to flash, we recommend checking the installation to make sure that there are no connection faults. If the LEDs continue to flash after you have checked the connections, you can start the recording since this is probably due to a power factor under 0.86 (in any case, it is a real power factor value of the installation).
The recording process can not be started when the REC LED is flashing, since this indicates a card write error, due to the following causes:

- o No memory card inserted in the unit's SD card slot.
- o The memory card inserted does not have the correct format or data can not be written. (for example, if the card is write protected or it has a FAT32 format; please change the format of the memory card to **FAT16**).

❖ *Why has the STD file been deleted from the root directory of the memory card?*

The STD file can be deleted from the memory card's root directory for the following reasons:

- o The user has changed the configuration of the clamps when powering the analyzer. This modifies the file header, deleting the file stored in the card and the energy value accumulated.
- o You have powered ***CIRe³*** without inserting the SD memory card in the unit. This loads the "*Default*" file with the specific setup. When you insert the memory card, the analyzer detects the new setup file. This is interpreted as a modification to the setup and the unit proceeds with the process explained in point 1.
- o When the unit sends the data to the Web application, the application creates a folder with the unit's serial number and it stores the file, renaming it with the date-day-hour when it was sent. The file might be stored in this folder if you have sent it to the Web application.

❖ *Why does the list of clamps not correspond to the selected scale?*

Basically, there are two reasons why the analyzer is configured with a list of current clamps that has not been established by the user:

- o You have not followed the scale selection process correctly, as established in the manual.
- o You have powered the analyzer while the current clamps (A connector) were not connected, so that the unit has not detected the clamps and is automatically configured with a 5 amp scale. If you then connect the clamps and restart the unit, the file header will be modified, so that the file that has recorded the data and the cumulative energy meter information will be deleted.

❖ *Why is the recording period different from the period you have configured?*

If the analyzer does not find the setup file from the root directory of the SD card, it is self-configured with the "*Default*" file, which has a 15 minute registration period.

❖ *What happens when the user enters an incorrect serial number when generating the setup file with the PC application?*

If you have created a setup file with the wrong name, i.e., the analyzer's serial number entered is incorrect, the analyzer will not use it as the unit's serial and it will configure itself with the "*Default*" file.

8.- REGULATIONS

ELECTRICAL SAFETY REGULATIONS
- IEC 60664-1 Insulation of low voltage equipment
- IEC 61010-1 Electrical safety
- IEC 62053-21 Active energy meters (class 1 and 2)
- UL 94 Enclosure flammability test
- VDE 110 Low voltage equipment insulation

ELECTROMAGNETIC EMISSIONS
- IEC 61000-3-2 Harmonics
- IEC 61000-3-3 Voltage Fluctuations
- IEC 61000-6-4 Industrial Emission
- EN 55011 Radioelectric alterations. Industrial, scientific and medical.
- EN 55022 Radioelectric alterations. Information technology equipment.

ELECTROMAGNETIC IMMUNITY
- IEC 61000-6-2 Industrial immunity.
- IEC 61000-4-2 Electrostatic discharge
- IEC 61000-4-3 Electromagnetic, radiated and radiofrequency fields
- IEC 61000-4-4 Quick transient bursts.
- IEC 61000-4-5 Shockwave.
- IEC 61000-4-8 Magnetic field at the industrial frequency
- IEC 61000-6-1 Domestic immunity.
- IEC 61000-4-11 Interruptions, gaps and power supply variations.
- ENV 50141 Radiofrequency in common mode.

PROTECTION DEGREE:
- IEC 60529 Enclosing protection degrees.

HOUSING SYMBOLS

Maximum input voltage 300 V

Reinforced insulation

9.- TECHNICAL SERVICE

Please contact the after sales service or technical service of **CIRCUTOR, S.A.** in case you have a question about the unit's operation or you have detected a fault.
CIRCUTOR S.A. - After Sales Service.

Vial Sant Jordi, s/n
08232 - Viladecavalls.
Tel - 93 745 29 00 / 902449459
Fax - 93 745 29 14
E-mail central@circutor.es

CIRCUTOR

10.- FEATURES OF THE E·FLEX 54 CLAMPS

CIRCUTOR

E-FLEX 20

AMPLIFICADOR INTEGRADO
BUILT-IN AMPLIFIER

Sensor flexible de corriente/
Flexible current sensor

CE

CARACTERÍSTICAS FÍSICAS Y AMBIENTALES/
PHYSICAL AND ENVIRONMENT FEATURES

Material Sonda	**Autoextinguible UNE 21031 90°C**
Materiale de Acoples	**PA V-0**
Diámetro Cable de Sonda	**14mm**
Longitud Cable de Salida	**2m**
Rango de Temperatura	**-20 °C to 85 °C**
Temperatura de Almacenamiento	**-40 °C to 85 °C**
Humedad Relativa	**15% to 85% (sin condensación)**
Protección	**IP65**

Probe Material	**Self-extinguishable UNE 21031 90°C**
Couplings Material	**PA V-0**
Probe Cable Diameter	**14mm**
Output Cable length	**2m**
Temperature Range	**-20 °C to 85 °C**
Storage temperature	**-40 °C to 85 °C**
Relative Humidity	**15% to 85% (without condensing)**
Protection	**IP65**

SÍMBOLOS / *SYMBOLS*

Atención! Revisar el manual/
Attention! Refer to manual

Doble aislamiento/
Double Isolation

Español

PRODUCTO
El sensor flexible de corriente permite realizar mediciones de corriente alterna en cualquier instalación con total rechazo de componentes DC, muy bajo consumo de potencia, sin problema de saturación, baja dependencia de la temperatura y muy buena linealidad.

La electrónica incorporada, integra y amplifica esta señal para finalmente obtener un voltaje proporcional a la corriente.

Las mejoras en dicha electrónica permiten obtener medidas de corriente alterna desde 20Hz hasta 10kHz con una muy buena linealidad y bajo desplazamiento de fase. Estas condiciones hacen a este transductor ideal para la medición de corriente y parámetros de calidad.

La electrónica se integra en la unión de la bobina flexible . Esto agrega una gran ventaja, debido al hecho de que el amplificador electrónico externo puede ser eliminado. La señal de salida del sensor (normalmente 2V CA f.s.) será obtenida directamente del transductor flexible, aunque tendrá que ser alimentado por una fuente de alimentación externa de 9-12VDC (que viene normalmente de la batería del analizador).

PRECAUCIONES DE SEGURIDAD
El sensor de corriente flexible ha sido diseñado y probado para cumplir el estándar de seguridad IEC 61010-1: 2001 61010-2-32:2002

Antes de utilizar el sensor de corriente flexible por primera vez, lea cuidadosamente lo siguiente:

1. La sonda debe ser utilizada por personal cualificado.
2. El uso de la sonda en conductores no aislados esta limitado a 600VACRMS o DC a frecuencias por debajo de 1kHz.
3. No exponga la sonda a ambientes agresivos o explosivos.
4. No utilice la sonda si tiene alguna razón para pensar que su funcionamiento no es correcto o que es defectuosa.
5. Para medidas sobre conductores no aislados utilice el equipo de protección personal apropiado y necesario.

English

PRODUCT
The non-intrusive flexible current sensor provides the ability to measure alternating current in any installation with a full rejection of DC component, very low power consumption, no saturation problem, very low temperature dependence, very good linearity.

The built-in electronics, integrate and amplify this signal to finally have a voltage proportional to the current.

Improvements in these electronics are capable to obtain measurements of alternating currents form 20Hz to 10kHz with a very good linearity and no phase displacement. These conditions make this transducer ideal for measuring power and energy parameters.

The electronic facilities are now built in the flexible coil junction. This adds a much bigger advantage due to the fact that external electronic transducer can be eliminated. The sensor output signal (normally 2V AC f.s.) will be obtained directly from the flexible current transducer, although it will have to be powered from an input power supply of 9-12VDC (normally coming from Analyzer battery).

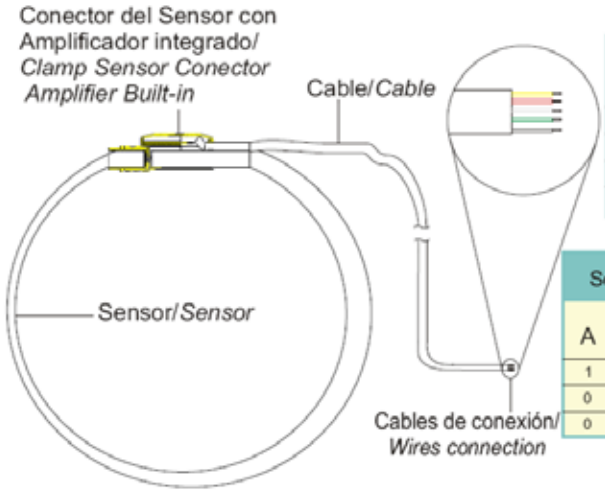
SAFETY PRECAUTIONS
The current flex sensor has been designed and tested to fulfil the safety standard IEC 61010-1: 2001 61010-2-32:2002

Prior to use the current flex sensor for the first time, read the following carefully:

1. *The probe must be only used by qualified personal.*
2. *Use of the probe on uninsulated conductors is limited to 600 VACRMS or DC to frequencies below 1kHz.*
3. *Do not expose the probe to aggressive or explosive environment.*
4. *Do not use the probe if there any reason to think that its no operating properly or that it is faulty.*
5. *For measuring in uninsolated conductor use the appropriate and necessary personal protection equipment.*

Características técnicas / *Technical features*

Características eléctricas/*Electrical Features*	
Voltaje típico de salida/*Typical Voltage Output* EoutRMS	**2 V f.s.**
Rango de Frecuencia/*Frequency Range*	**20Hz - 10kHz**
Voltaje de trabajo/*Working Voltage*	**600VACRM**
Rango de corriente en primario/*Rated primary current*	**20kA/2kA/200A**
Linealidad/*Linearity* (10% to 100%)	**+/- 0.2%**
Coeficiente max. de temperatura/ *Temperature Coefficient max.*	**+/- 0.05%**
Sensibilidad de posición (Unión Cable)/ *Position sensibility(junction Cable)*	**+/- 3%**
Campos externos/*External Field*	**+/- 2%**
Seguridad Eléctrica/*Electrical Safety*	
Aislamiento/*Isolation*	**Doble Aislamiento/Double Isolation**
Clase de protección/*Protection class*	**II IEC/EN 61010-1:2001**
Categoría de sobrevoltaje/*Overvoltage Category*	**CAT III**
Voltaje de Trabajo/*Working Voltage*	**600VRMS**
Grado de Contaminación/*Pollution Degree*	**2**
Rigidez Dielectrica/*Dielectric strength*	**IEC/EN 61010-2-32:2002, 5,4 kV 50Hz**



Cables de conexion	
Amarillo	Selector de escala(A)
Marron	Selecto de escala(B)
Blanco	Vcc (9v-12v DC)
Verde	Vout (2v AC f.s.)
Gris	Gnd

Wires Connection	
Yelow	Range Selector (A)
Brown	Range Selector (B)
White	Vcc (9v-12v DC)
Green	Vout (2v AC f.s.)
Gray	Gnd

Selección de escala		
A	B	Escala
1	0	20kA
0	1	2kA
0	0	200A

Range Selection		
A	B	Range
1	0	20kA
0	1	2kA
0	0	200A

MODELOS / *MODELS*		
MODELO/ *MODEL*	LONGITUD DEL SENSOR/ *LENGTH OF SENSOR*	ESCALA/ *RANGE*
E-FLEX20	54 - 80 - 120 cm	20KA/2KA/200A
E-FLEX15	54 - 80 - 120 cm	15KA/1.5KA/150A
E-FLEX10	54 - 80 - 120 cm	10KA/1KA/100A
E-FLEX6	54 - 80 - 120 cm	6KA/0.6KA/60A

MODELOS / *MODELS*		
MODELO/ *MODEL*	SENSIBILIDAD/ *SENSITIVITY*	Vsalida *Vout*
E-FLEX20	0.1mV/A;1mV/A;10mV/A	2 Vrms
E-FLEX15	0.13mV/A;1.3mV/A;13mV/A	2 Vrms
E-FLEX10	0.2mV/A;2mV/A;20mV/A	2 Vrms
E-FLEX6	0.33mV/A;3.3mV/A;33mV/A	2 Vrms

Español

CONEXIONES EXTERNAS

La electrónica incorporada debe ser alimentada externamente, en el rango 9 a 12 voltios D.C.. Se recomienda 12V para obtener mejores resultados (A través de los cables Vcc y Gnd).
Para el control de escala de medida hay un multiplexor interno que se debe controlar externamente (A través de los cables A y B).

USO DEL SENSOR DE CORRIENTE

1. Antes de utilizar el sensor de corriente, asegurese que las condiciones son las apropiadas para trabajar y que el equipo de protección es el adecuado.
2. Asegurese de que los cables de conexión están correctamente configurados
3. Desenganche el conector y rodee, con la sonda, el conductor a medir.
4. Cierre el conector asegurándose de su anclaje.
5. Posicione el conductor centrado en relación al sensor.

MANTENIMIENTO

El sensor de corriente no requiere un mantenimiento especial.

English

EXTERNAL CONNECTIONS

The built-in electronics should be externally supplied in the range 9 to 12 Volt DC. It is recommended 12V for the external supply to better results (Trough of Vcc and Gnd wires).
For the measuring range control there is an internal multiplexer that should be externally controlled too(Trough of A and B wires).

USING THE CURRENT SENSOR

1. Before using the current flex sensor ensure that the conditions are the appropriates for working, and that the protection equipment is the adequate.
2. Ensure that the wires connection are configured correctly
3. Disengage the snap connector and surround the conductor to measure.
4. Close the snap connector ensuring their anchorage.
5. Put the conductor centred within the sensor.

MAINTENANCE

The current flex sensor do not require a special maintenance.

PARÁMETRO / PARAMETER	MIN	MAX	UNIDAD/UNIT
ALIMENTACIÓN/*POWER SUPPLY*			
Rango de voltaje/*Vcc Specified Voltage Range*	9	12	V D.C.
Iq/*Iq Quesciente*	4	10	mA D.C.
SELECTOR DE ESCALA/ *RANGE SELECTOR*			
VIH Rango de voltaje del selector nivel alto /*high-level input voltage range selector*	10	12	V D.C.
VILRango de voltaje del selector nivel bajo /*low-level input voltage range selector*		3	V D.C.
CARGA/*LOAD*			
RL Valor de Carga / *Load Value*	10k	100k	Ohms.

* f.s. Full scale

11.- EC CERTIFICATE

DECLARACION DE CONFORMIDAD CE
CE DECLARATION OF CONFORMITY
DECLARATION DE CONFORMITE CE

Por la presente CIRCUTOR, S.A.
We hereby
Par le présent

Con dirección en: Vial Sant Jordi, s/n
With address in: 08232 VILADECAVALLS (Barcelona)
Avec adresse à: ESPAÑA

Declaramos bajo nuestra responsabilidad que el producto:
We declare under our responsibility that the product:
Nous déclarons sous notre responsabilité que le produit:

Equipo portátil para auditorías energéticas **Serie: CIR-e3**

Marca CIRCUTOR

Siempre que sea instalado, mantenido y usado en la aplicación para la que ha sido fabricado, de acuerdo con las normas de instalación aplicables y las instrucciones del fabricante,
Provided that it is installed, maintained and used in application for which it was made, in accordance with relevant installation standards and manufacturer's instructions,
Toujours qu'il soit installé, maintenu et utilisé pour l'application par lequelle il a été fabriqué, d'accord avec les normes d'installation applicables et suivant les instructions du fabricant,

Cumple con las prescripciones de la(s) Directiva(s):
Complies with the provisions of Directive(s):
Accomplie avec les prescriptions de la (les) Directive(s):

2006/95/CE
2004/108/CE
98/37/CE

Está en conformidad con la(s) siguiente(s) norma(s) u otro(s) documento(s) normativo(s) :
It is in conformity with the following standard(s) or other normative document(s) :
Il est en conformité avec la (les) norme(s) suivante(s) ou autre(s) document(s) normatif (ves) :

IEC 60664-1	IEC 61000-6-2
IEC 61010-1	IEC 61000-4-3
IEC 62053-21	IEC 61000-4-4
IEC 61000-3-2	IEC 61000-4-5
IEC 61000-3-3	IEC 61000-4-8
IEC 61000-6-4	IEC 61000-6-1
EN 55011	IEC 61000-4-11
EN 55022	IEC 60529
UL 94	ENV 50141
VDE 110	

Año de colocación del marcado "CE": 2009
Year of affixing "CE" marking:
An de mise en application du marquage "CE":

Revisado en Viladecavalls
Fecha:26/02/2009

Nombre y Firma :
Name and signature :
Nom et signature :

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